# NEW SPECIES OF *STELLICOLA* (COPEPODA, CYCLOPOIDA) ASSOCIATED WITH STARFISHES IN MADAGASCAR, WITH A REDESCRIPTION OF *S. CAERULEUS* (STEBBING, 1900)

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# NEW SPECIES OF *STELLICOLA* (COPEPODA, CYCLOPOIDA) ASSOCIATED WITH STARFISHES IN MADAGASCAR, WITH A REDESCRIPTION OF *S. CAERULEUS* (STEBBING, 1900)

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#### INTRODUCTION

Two species of the lichomolgid genus *Stellicola* (a genus usually living in association with asteroid echinoderms) are known from starfishes in the region of Nosy Bé, in northwestern Madagascar. *S. oreastriphilus* Kossmann, 1877, occurs commonly on *Protoreaster lincki* (Blainville), *Culcita schmideliana* (Retzius), *Pentaceraster mammillatus* (Audouin), and *Poraster superbus* (Möbius) (Humes & Cressey, 1961), and more rarely on *Choriaster granulatus* (Lütken) (Humes & Ho, in press). A second species of *Stellicola*, whose description by Humes and Ho is in press, also occurs on *Choriaster granulatus*. Five new species from the region of Nosy Bé are now to be added, bringing the total number of species in that area to seven.

The field work was done by the first author, in 1960 while a member of an expedition sent to Madagascar by the Academy of Natural Sciences of Philadelphia, and in 1963–64 while participating in the U.S. Program in Biology of the International Indian Ocean Expedition.

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We are also indebted to Dr. J. P. Harding of the British Museum (Natural History) for information on the whereabouts of Thompson and A. Scott's Ceylonese copepods and to Miss Patricia D. Lofthouse of the same museum for arranging the loan of syntypes of *S. caeruleus* with permission to dissect a male and a female.

The material covered in this paper comprises:

Stellicola kossmanni, new species
Stellicola affinis, new species
Stellicola longiseta, new species
Stellicola femineus, new species
Stellicola pollex, new species
Stellicola oreastriphilus Kossmann, redescription in part
Stellicola caeruleus (Stebbing), redescription of syntypes

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# STELLICOLA Kossmann, 1877

#### Stellicola kossmanni n. sp.

Pl. 1, figs. 1-6; Pl. 2, figs. 7-15; Pl. 3, figs. 16-21; Pl. 4, figs. 22-24.

Type Material. 4  $\[ \varphi \]$  and 14  $\[ \beta \]$  from washings of 83 starfishes, *Protoreaster lincki* (Blainville), in a depth of 0.5 m. at Pte. Antsamantsara, west of Madirokely, Nosy Bé, Madagascar. Collected 7th July, 1963. Holotype female, allotype, and 13 paratypes (2  $\[ \varphi \]$ , 11  $\[ \beta \]$ ) deposited in the British Mus. (Nat. Hist.) Reg. No. 1966.12.7.1–3; the remaining 3 paratypes (dissected) in the collection of A. G. Humes.

Female. Body (Pl. I, fig. I) with moderately broadened prosome. Length (not including setae on caudal rami) I·o mm. (0·95-I·03 mm.) and greatest width 0·46 mm. (0·44-0·47 mm.), based on IO specimens (holotype, 3 paratypes, and 6 specimens from Pte. Mahatsinjo, 4th July, 1963). Ratio of length to width of prosome I·45: I. Segment of leg I separated dorsally and laterally from head by a furrow. Epimeral areas of segments of legs I-4 rounded; lateral margins of segments of legs I-3 with membrane (Pl. I, fig. 2).

Segment of leg 5 (Pl. 1, fig. 3) 83  $\mu$  long and 105  $\mu$  in greatest width; fifth legs borne slightly dorsally. Between this segment and genital segment a short intersegmental sclerite ventrally. Genital segment longer than wide, 146  $\mu$  in length, 127  $\mu$  in width in its anterior three-fourths where its lateral margins are somewhat irregular, and 85  $\mu$  in width in its constricted posterior fourth. Areas of attachment of egg sacs situated dorsolaterally just in front of posteriormost fourth; each area (Pl. 1, fig. 4) with 2 long setae (outer 82  $\mu$  long and bearing minute unilateral spinules, inner 36  $\mu$  and feathered) and between them a small spinous process 6  $\mu$  long. Posterior margin of segment with a membrane having a ragged edge simulating small spinules especially laterally. Three postgenital segments, first 44  $\times$  75  $\mu$  with a similar posterior membrane, second 18  $\times$  68  $\mu$ , and third 28  $\times$  65  $\mu$ .

Caudal ramus (Pl. I, fig. 5), inserted ventrally on anal segment, quadrate,  $31 \times 29 \,\mu$ . Long naked setule (34  $\mu$ ) midway on outer margin. Pedicellate dorsal seta 65  $\mu$  and haired. Outer lateral seta 109  $\mu$  and naked, inserted close to outermost terminal seta (156  $\mu$ , with a few spinules on each side in its proximal third). Innermost terminal seta 216  $\mu$  and naked. Two long terminal setae, inserted between dorsal (smooth) and ventral (with a row of prominent setules) flaps, 429  $\mu$  (outer) and 600  $\mu$  (inner) and both with lateral spinules; "pegged" region of these two setae finely punctate. A small hair on ventral surface of ramus.

Dorsal surface of prosome with scattered hairs (sensilla). Dorsal surface of urosome with hairs as shown in Pl. 1, fig. 3; ventral surface less ornamented with hairs. Ratio of length of prosome to that of urosome 1.87:1.

Egg sac (Pl. 1, fig. 1) elongated,  $520 \times 275 \mu$ , extending far beyond caudal rami, and containing many eggs about  $50 \mu$  in diameter.

Rostral area (Pl. 1, fig. 6) rounded, not strongly sclerotized.

First antenna (Pl. 2, fig. 7) 7-segmented, lengths of segments (measured along their posterior non-setiferous margins) being 39 (50  $\mu$  along anterior margin), 74, 31, 41, 34, 18, and 16  $\mu$  respectively. Formula for armature: 4, 13 (5 + 2 + 6), 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete. All setae naked except 1 on second segment and 4 on last 3 segments which are delicately haired. Terminal seta on segment 7 very long (260  $\mu$ ), equal to length of entire first antenna. Aesthete on segment 7 arising from common base with adjacent long naked seta. Ventral surface of segment 3 with sclerotization suggesting an intercalary segment.

Second antenna (Pl. 2, fig. 8) relatively slender and 3-segmented, third segment showing a partial division on anterior surface but entire posteriorly. First segment with a smooth seta, second with a haired seta, and third with 3 haired setae near the incomplete division and terminally with 6 elements: a stout claw 42  $\mu$  along its axis, 4 long naked setae, and a short blunt naked seta. Anterior surface of second antenna pilose, with 4 slender setules subterminally on last segment. Long setae annulated.

Labrum (Pl. 2, fig. 9) with its two posteroventral lobes somewhat angular and unornamented.

Mandible (Pl. 2, fig. 10) with an outer row of slender spinules and an inner row of rather stout blunt teeth preceded proximally by a prominent dentiform process; both rows diminishing to minute spinules along the slender terminal lash. Paragnath a small lobe hidden under lobe of labrum in ventral view. First maxilla (Pl. 2, fig. 11) an elongated lobe with 3 naked setae and 1 stout spiniform element strongly spinose on its posterolateral surface. Second maxilla (Pl. 2, fig. 12) 2-segmented; first segment unarmed, its proximal ventral margin projecting strongly; second segment with 2 postero-inner elements (a slender seta with short lateral spinules and a spine with rows of spinules) and terminating in a spiniform process bearing rows of teeth as in the figure (proximal tooth larger than others, producing a bifurcated appearance). Maxilliped (Pl. 2, fig. 13) 3-segmented; first segment unarmed, second with 2 setae and anterior surficial spinules, and third with 2 setae (1 with lateral spinules, other naked) and terminating in a spiniform process bearing lateral spinules.

Area between maxillipeds and first pair of legs (Pl. 2, fig. 14) not protuberant, with a distinct sclerotized line between bases of maxillipeds.

Rami of legs 1-4 (Pl. 2, fig. 15, Pl. 3, figs. 16, 17, and 18) 3-segmented, except endopod of leg 4 which is weakly 2-segmented. Spine and setal formula as follows (Roman numerals indicating spines, Arabic numerals setae):

$P_1$	protopod	0-1;	I-0	exp	I–o ;	I-ı;	III, I, 4
				end	O-I;	O−I;	I, 5
$P_2$	protopod	O-I;	I-0	exp	I-o ;	I-ı;	III, I, 5
				end	O-I;	0-2;	I, II, 3
$P_3$	protopod	O-I;	I-O	exp	I-o ;	I-ı;	III, I, 5
				end	O-I;	0-2;	I, II, 2
$P_4$	protopod	O-I;	<b>I</b> -0	exp	I–o ;	I-ı;	II, I, 5
					O-I;	II, 1	

Inner seta on coxa feathered in legs I-3 but naked (42  $\mu$  long) in leg 4. Hairs on inner margin of basis in legs I-3 absent in leg 4. Expansion of basis over anterior surface of first segment of exopod rather acute. Between 2 terminal spines on last segment of endopod of leg 2 a bifurcated spinous process. On second segment of exopod of leg 4 relatively short inner seta lying (in alcoholized specimens) nearly parallel to ramus and having short lateral spinules instead of the usual long hairs. Endopod of leg 4 two-segmented, with a line of separation visible on both anterior and posterior surfaces, but with the lateral sclerotization continuous between the two segments. First segment 26 × 24  $\mu$  (greatest dimensions) with inner distal seta 84  $\mu$  long, spiniform, with short lateral spinules. Second segment 46 × 21  $\mu$  (greatest dimensions), the feathered inner seta 67  $\mu$ , the 2 terminal spines 105  $\mu$  (inner) and 58  $\mu$  (outer) both with delicately serrate lamellae; a row of minute spinules anteriorly across end of segment near insertions of 2 spines, and a row of hairs on proximal half of outer margin of segment.

Leg 5 (Pl. 3, fig. 19) with free segment elongated,  $32 \times 14 \mu$ . Two very unequal terminal setae, outer  $102 \mu$  long, with minute lateral spinules, inner  $55 \mu$ , with delicately serrate lamellae. Seta on body near insertion of free segment  $40 \mu$  and feathered.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 1, figs. 3 and 4).

Colour in life in transmitted light faintly reddish, eye red, intestine dark brown, ovary reddish brown.

MALE. Body form (Pl. 3, fig. 20) resembling that of female, though prosome somewhat narrower. Length (excluding setae on caudal rami) 0.71 mm. (0.69–0.74 mm.) and greatest width 0.27 mm. (0.26–0.28 mm.), based on 10 specimens. Ratio of length to width of prosome 1.72:1.

Segment of leg 5 (Pl. 3, fig. 21)  $33 \times 70 \mu$ . Ventral intersegmental sclerite absent. Genital segment about as long as wide,  $99 \times 94 \mu$ , with slightly rounded lateral margins in dorsal view. Four postgenital segments  $42 \times 66$ ,  $34 \times 58$ , II  $\times$  50, and  $2I \times 52 \mu$  from anterior to posterior.

Caudal ramus like that of female but smaller, 23  $\times$  23  $\mu$ .

Surfaces of prosome and urosome, as in female, ornamented with hairs. Ratio of length of prosome to that of urosome i.85:i.

Rostral area, first antenna, second antenna, labrum, mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped (Pl. 4, fig. 22) slender and 4-segmented. First segment unarmed, second with 2 naked setae and 2 rows of spinules, and third small and unarmed. Proximal part of terminal claw probably representing fourth segment. Claw for  $\mu$  in length (measured along its axis), recurved, showing a slight evidence of division about midway and having a fringe of delicate hyaline spinules along its concave edge; bearing 2 setae proximally, one small naked and hyaline 12  $\mu$  long, other long (50  $\mu$ ) with a few distal spinules.

Area between maxillipeds and first pair of legs like that in female.

Legs I-4 resembling those of female, with same spine and setal formula. Endopod of leg 4 with 2 terminal spines differing in their proportional lengths. Measurements

for this ramus: first segment 19  $\times$  18  $\mu$  with seta 66  $\mu$ , second segment 33  $\times$  17  $\mu$  with seta 45  $\mu$  and 2 terminal spines 80  $\mu$  and 47  $\mu$  (ratio of these 2 spines 1·7:1, instead of 1·8:1 in female).

Leg 5 resembling that of female, with free segment 21  $\times$  8  $\mu$  and 2 terminal elements 70  $\mu$  and 34  $\mu$  respectively.

Leg 6 (Pl. 4, fig. 23) consisting of posterolateral flap on ventral surface of genital segment and bearing a minute spiniform process and 2 unequal setae, one naked (69  $\mu$ ), other feathered (33  $\mu$ ). In view of entire urosome these setae conspicuous (see Pl. 3, fig. 21).

Spermatophore (Pl. 4, fig. 24), inside body of male, elongated, 86  $\times$  31  $\mu$  without neck.

Colour in life in transmitted light resembling that of female.

(This species is named for Dr. Robby Kossmann, who originally described the genus *Stellicola*).

Comparison with related species. There are at present fifteen species known with some certainty to belong to the genus Stellicola (14 with published descriptions and I whose description by Humes and Ho is in press). Stock (1957) included S. thorelli Kossmann, 1877, S. pleurobranchi Kossmann, 1877, S. oreastriphilus Kossmann, 1877, S. caeruleus (Stebbing, 1900), S. curticaudatus (Thompson & A. Scott, 1903), S. gracilis (Thompson & A. Scott, 1903), S. gracilis (Thompson & A. Scott, 1903), and S. asterinae (Bocquet, 1952), a species later synonymized with S. clausi (Rosoll, 1889) by Bocquet and Stock (1962). The four West African species (S. frequens, S. astropectinis, S. luidiae, and S. lautus) originally described by Humes & Cressey (1958) in the genus Lichomolgus also belong to Stellicola, as pointed out by Bocquet and Stock (1962). In Stellicola there should also be included S. holothuriae (Ummerkutty, 1961) and probably S. longicaudatus (Thompson & A. Scott, 1903).

- S. kossmanni may be separated from these fifteen species as follows: in gracilis, lankensis, and the new species of Humes & Ho (in press) there are two postgenital segments in the female and three in the male; in frequens, astropectinis, luidiae, and lautus there are three claws on the second antenna; in clausi there are two claws on the second antenna; and in oreastriphilus, holothuriae, thorelli, pleuro-branchi, curticaudatus, longicaudatus, and caeruleus, although the second antenna has only a single claw, the length ratio of prosome to urosome in the female (ranging from 2·3-3·3: I) is distinctly more than 2: I.
- S. kossmanni shows several features which may be used as identifying characters: the very long terminal seta on the first antenna (as long as the antenna itself), the four slender subterminal setules on the second antenna (these in addition to the six terminal elements), the strongly spinose element on the first maxilla, and in leg 4 the detailed ornamentation of the four elements on the endopod and the nature of the inner seta on the second segment of the exopod.

# Stellicola affinis n. sp.

Pl. 4, figs. 25-31; Pl. 5, figs. 32-41; Pl. 6, figs, 42-48.

Type material.  $84 \circ and 26 \circ$ maculata (Müller & Troschel), exposed on sand bar at low tide on the eastern side of Ankify, on the mainland of Madagascar, opposite Nosy Komba, and about 15 kilometers south of Nosy Bé. Collected 8th August, 1964. Holotype female, allotype, and 51 paratypes (40 \, 11 \, \delta\) deposited in the British Mus. (Nat. Hist.) Reg. No. 1966.12.7.4-6; 27 paratypes (20 \, \, 7 \, \forall\) in the United States National Museum, Washington; and the remaining paratypes in the collection of A. G. Humes.

Other specimens (all in the vicinity of Nosy Bé). From Maculaster maculata maculata: 16 \( \text{\text{\text{\text{9}}}} \) from I host, exposed on sand bar at Ankify (the type locality), oth September, 1964. From Maculaster savignyi (Audouin): 38 \, 9, 6 \, 6 from 9 hosts, exposed on sand bar at Ankify, 8th August, 1964; 60 \, 27 \, from I host. in 2 m., eastern shore of Ambariobe, a small island between Nosy Komba and Nosy Bé, 4th October, 1964; 12 \, 3 \, 3 from I host, on sand exposed at low tide, Ambariobe, 21st July, 1963. From Retaster cribrosus von Martens: 11 \, 5 \, 5 \, from 1 host, exposed on sand bar, Ankify, 2nd November, 1963. From Luidia maculata Müller & Troschel: 35 \( \text{?}, \) 16 \( \text{?} \) from 2 hosts, dredged in 17 m., 13° 16' S, 48° 31' 30" E, northeast of Nosy Faly, 14th September, 1960.

FEMALE. Body (Pl. 4, figs. 25 and 26) relatively slender. Length (not including setae on caudal rami) 1.01 mm. (0.98-1.04 mm.) and greatest width 0.35 mm. (0.32-0.37 mm.), based on 10 specimens. Ratio of length to width of prosome 1.56: I. Epimeral areas of segment of leg 4 pointed.

Segment of leg 5 (Pl. 4, fig. 27)  $61 \times 97 \mu$ . Between this segment and genital segment a short intersegmental sclerite ventrally. Genital segment elongated, 156  $\mu$  in length, being somewhat wider in its anterior two-thirds (109  $\mu$ ) than in its posterior third (80  $\mu$ ). Areas of attachment of egg sacs located dorsolaterally on anterior part of middle third; each area (Pl. 4, fig. 28) bearing 2 short naked setae (outer 13  $\mu$  long, inner 17  $\mu$ ), with a small spinous process about 5  $\mu$  long between them. Two postgenital segments, first  $56 \times 63 \mu$ , second (anal) 43  $\mu$  long and

72  $\mu$  in greatest width (this segment deeply incised).

Caudal ramus (Pl. 4, fig. 29) divergent, inserted a little ventrally on anal segment, elongated and somewhat narrowed distally, in one female 106  $\mu$  (greatest length)  $\times$  15  $\mu$  (width taken at level of outer seta) making a ratio of 7: 1, in another female  $108 \times 17 \,\mu$ , ratio of 6.3:1. Minute setule  $(4 \,\mu \, long)$  on outer proximal margin. Another small setule (8  $\mu$ ) on outer margin just beyond midpoint of ramus (perhaps corresponding to long marginal setule in S. kossmanni). Pedicellate dorsal seta 25  $\mu$ . Outer lateral seta 74  $\mu$ , inserted near end of ramus. Innermost terminal seta 130  $\mu$ , outermost terminal seta 88  $\mu$ , and 2 long median terminal setae, inserted between dorsal (smooth) and ventral (with a row of minute spinules) flaps, 242  $\mu$ (outer) and 363  $\mu$  (inner). All setae naked. Both outer and inner walls of ramus with an interruption in sclerotization as shown in figure. Two minute hairs on ventral surface of ramus.

Dorsal surface of prosome with scattered hairs. Dorsal surface of urosome with hairs as shown in Pl. 4, fig. 27; ventral surface much less ornamented with hairs. Ratio of length of prosome to that of urosome  $\mathbf{r} \cdot \mathbf{30} : \mathbf{r}$ . Egg sac (Pl. 4, fig. 25) fairly elongated,  $374 \times \mathbf{r}43~\mu$ , extending not quite to the ends of caudal rami, and containing a moderate number of eggs about 50  $\mu$  in

diameter.

Rostral area (Pl. 4, fig. 30) rounded.

First antenna (Pl. 4, fig. 31) 7-segmented, lengths of segments (measured along their posterior non-setiferous margins) being 30 (47  $\mu$  along anterior margin), 67, 23, 25, 31, 19, and 14  $\mu$  respectively. Formula for armature as in *S. kossmanni*. Setae naked except for I on antepenultimate segment, I on penultimate segment, and 2 on last segment which are delicately haired. Long terminal seta 213  $\mu$  in length, nearly as long as entire first antenna. Aesthete on last segment having a common base with adjacent seta. Sclerotization on ventral surface of segment 3 suggesting an intercalary segment.

Second antenna (Pl. 5, fig. 32) 3-segmented, with no evidence of division of third segment. Armature I; I; 3+5+I claw, as in S. kossmanni, though relative lengths and fine ornamentation of setae different (compare Pl. 2, fig. 8 and Pl. 5, fig. 32). Claw 4I  $\mu$  along its axis. Anterior surface of second antenna not pilose as in S. kossmanni; posterior surface with very fine punctations.

Labrum (Pl. 5, fig. 33) with subtriangular unornamented lobes.

Mandible (Pl. 5, fig. 34) in general resembling that of *S. kossmanni*, but first element in inner row of teeth less prominent and terminal lash relatively shorter. Paragnath a small indistinct lobe medial to insertions of mandible and first maxilla

Paragnath a small indistinct lobe medial to insertions of mandible and first maxilla (Pl. 5, fig. 38). Four elements on first maxilla (Pl. 5, fig. 35), including spine with lateral rows of spinules. Second maxilla (Pl. 5, fig. 36) 2-segmented, with proximal ventral margin of unarmed first segment rather angularly produced; second segment with long inner spine having serrated flanges (with serrations especially prominent along distal flange) and with terminal process bifurcated as shown in figure. Maxilliped (Pl. 5, fig. 37) 3-segmented, with armature resembling that of S. kossmanni; second segment lacking rows of small spinules seen in that species.

Area between maxillipeds and first pair of legs only slightly protuberant (Pl. 4, fig. 26); a sclerotized line connecting bases of maxillipeds (Pl. 5, fig. 38).

Rami of legs 1–4 (Pl. 5, figs. 39, 40, 41, and Pl. 6, fig. 42) with same segmentation and spine and setal formula as in S. kossmanni. Inner seta on coxa relatively long and feathered in legs 1–3 but short (19  $\mu$ ) and naked in leg 4. Hairs on inner margin of basis absent in leg 4 and apparently also in leg 1. In legs 1–3 expansion of basis over anterior surface of first segment of exopod with membranous tip; this expansion absent in leg 4. Second segment of exopod of leg 4 with inner seta like that in S. kossmanni. Endopod of leg 4 two-segmented, with distinct articulation between these segments. First segment 31 × 25  $\mu$  (greatest dimensions) with finely barbed inner seta 91  $\mu$  long. Second segment 50 × 24  $\mu$  (greatest dimensions), the inner seta finely barbed and 48  $\mu$ , the 2 terminal spines 62  $\mu$  (inner) and 51  $\mu$  (outer), both with delicately serrate lamellae. Rows of long hairs along outer margins of both segments, with row on second segment interrupted. Row of minute spinules

on anterior surface across end of segment near insertions of 2 spines.

Leg 5 (Pl. 6, fig. 43) with elongated free segment,  $28 \times 13 \mu$ . Two unequal terminal setae, outer 61  $\mu$  long with a few minute barbs distally, inner 39  $\mu$  with outer serrated fringe. Seta on body near insertion of free segment 25  $\mu$  long and delicately feathered.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 4, fig. 28).

Colour in life in transmitted light slightly opaque, ovary dark gray, eye dark blackish red, egg sacs dark gray.

MALE. Body form (Pl. 6, fig. 44) resembling that of female but more slender. Length (without ramal setae) 0.78 mm. (0.75-0.82 mm.) and greatest width 0.22 mm. (0.21-0.23 mm.), based on 10 specimens. Ratio of length to width of prosome 1.84:1.

Segment of leg 5 (Pl. 6, fig. 45) 31  $\times$  65  $\mu$ . Ventral intersegmental sclerite absent. Genital segment subquadrate, 133  $\times$  117  $\mu$ , a little longer than wide, with lateral borders nearly parallel in dorsal view. Three postgenital segments 47  $\times$  59, 43  $\times$  46, and 26  $\times$  46  $\mu$  from anterior to posterior.

Caudal ramus (see Pl. 6, fig. 45) resembling that of female, but proportionately more slender, 90  $\times$  12  $\mu$ , with ratio of 7.5: 1, and a little more narrowed in its distal half.

Surfaces of prosome and urosome, as in female, ornamented with hairs. Ratio of length of prosome to that of urosome 1.16:1.

Rostral area, first antenna, second antenna, labrum, mandible, paragnath, and first maxilla like those of female. Second maxilla also resembling that of female but proximal ventral margin of first segment less produced and more rounded. Maxilliped (Pl. 6, fig. 46) slender and 4-segmented. First segment unarmed. Second segment with 2 slender naked setae and 2 rows of spinules (1 row short, consisting of only about 5 spinules.) Third segment short and unarmed. Proximal part of claw probably representing fourth segment. Slender gently recurved claw III  $\mu$  along its axis, with evidence of division about midway and having a fringe of delicate hyaline spinules along its concave margin; bearing proximally 2 setae, one II  $\mu$  and naked, other 29  $\mu$  long with a few minute barbs near its tip.

Area between maxillipeds and first pair of legs like that in female.

Legs I-4 resembling those of female, with same spine and setal formula. Endopod of leg 4 much like that in female, with 4 elements from inner to outer 72, 35, 43, and 34  $\mu$  long.

Leg 5 (Pl. 6, fig. 47) with free segment  $21 \times 8 \mu$ , more slender than in female, and 2 terminal setae more unequal, 53  $\mu$  and 22  $\mu$  (ratio of 2·4: I, instead of I·56: I in female).

Leg 6 (Pl. 6, fig. 48) consisting of posterolateral flap on ventral surface of genital segment and bearing 2 slender naked setae 25 and 38  $\mu$  long.

Spermatophores not observed.

Colour in life in transmitted light resembling that of female.

[The specific name affinis, Latin = adjoining or related, refers to the close similarity of this species with *Stellicola gracilis* (Thompson & A. Scott) as discussed below].

Comparison with other species. At present there are three species known in the genus *Stellicola* which, like *S. affinis*, have two postgenital segments in the female and three in the male. These are *S. gracilis* (Thompson & A. Scott, 1903), *S. lankensis* (Thompson & A. Scott, 1903), and the species whose description by Humes and Ho is in press. *S. lankensis* (of which only the female is known), from washings of dredged invertebrates in Ceylon, has a much shorter caudal ramus (proportions of about 2·37: I in T. & S.'s pl. XV, fig. 25). The new species of Humes and Ho differs in having a quadrate caudal ramus, in its smaller size (female 0·79 mm., male 0·64 mm.), and in many other features.

S. gracilis, from washings of dredged invertebrates in Ceylon, is known only from the original description and figures by Thompson & A. Scott. The existence of type material (the "several males and females" of Thompson & A. Scott) is extremely doubtful. The type specimens of S. gracilis were apparently deposited in the University of Liverpool, where Dr. W. A. Herdman, the author of the Report on Pearl Oyster Fisheries, was professor of natural history. An inquiry recently made by Dr. J. P. Harding of the British Museum to the Department of Oceanography of Liverpool University drew the reply that the Andrew Scott collection had been discarded. Our only available information on S. gracilis is, then, to be found in the brief original description.

When S. affinis is compared with S. gracilis certain similarities are obvious. The two species are of about the same length and have the same number of postgenital segments. In the female of both the anal segment is cleft deeply, the caudal rami are divergent, the genital segment has a similar shape, the second antenna appears to have the same general form, the base of the mandible is somewhat angular. and the first segment of the second maxilla seems to project. In the male of both the maxilliped is rather similar.

There exist, however, differences between the two species which in our opinion make it impossible to regard them as one and the same species. In the female of S. gracilis the proportions of the caudal ramus are about 4:I (instead of 6:3:I or 7:I as in S. affinis), the two inner setae on the endopod of leg 4 are distinctly feathered (while in S. affinis these setae have very minute barbs), and (based on measurements of T. & S.'s pl. XV, fig. I) the ratio of the length of prosome to urosome is I:I (I:30:I in S. affinis) and the ratio of length to width of the prosome is I:75:I (I:56:I in S. affinis). T. & S.'s pl. XV, fig. 4, shows only three elements on the first maxilla, but a fourth minute seta may have escaped their notice. They describe the tip of the second maxilla as "triangular, sharp and wedge-shaped", illustrated on pl. XV, fig. 5, but their description is wanting in detail.

We conclude that S. affinis, while related to S. gracilis, is a separate species.

# Stellicola longiseta n. sp.

Pl. 6, figs. 49-50; Pl. 7, figs. 51-60; Pl. 8, figs. 61-66.

Type material. 2 and 3 of from washings of I starfish, *Mithrodia clavigera* (Lamarck), under dead coral (*Acropora*) in a depth of I m., Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar. Collected 3rd September, 1963. Holo-

type female, allotype, and 2 paratypes (I P, I B) deposited in the British Mus. (Nat. Hist.) Reg. No. 1966.12.7.7-9; the remaining paratypic male (dissected) in the collection of A. G. Humes.

Other specimens (from Mithrodia clavigera in the same locality). 2 \( \rightarrow \) from I host in 1 m., 14th December, 1963.

Female. Body (Pl. 6, fig. 49) with prosome relatively thickened as in S. affinis, but broader than in that species. Length (excluding setae on caudal rami) 1.18 mm. (I·I4-I·22 mm.) and greatest width 0·60 mm. (0·58-0·62 mm.), based on 4 specimens (holotype, I paratype, and 2 specimens collected on 14th December, 1963). Ratio of length to width of prosome 1.36: 1. Segment of leg I separated from head by a dorsal and lateral furrow. Epimeral areas of segment of leg 2 rather pointed posteriorly; those of segments of legs 1, 3, and 4 rounded.

Segment of leg 5 (Pl. 6, fig. 50) 88  $\times$  146  $\mu$ . Between this segment and genital segment a short intersegmental sclerite ventrally. Genital segment a little longer than wide, 177  $\mu$  in length, 159  $\mu$  in width in its anterior two-thirds, and 114  $\mu$  in width in its constricted posterior third, and showing a slight middorsal hump anteriorly. Areas of attachment of egg sacs situated dorsolaterally on anterior part of posterior third; each area (Pl. 6, fig. 50) with 2 setae (outer 77  $\mu$  long and naked, inner 23  $\mu$  and feathered) and between them a small spinous process 6  $\mu$  long. Posterior margin of genital segment with a membrane which simulates spinules laterally. Two postgenital segments  $52 \times 95$  and  $34 \times 88 \mu$  respectively.

Caudal ramus (Pl. 7, fig. 51), inserted ventrally on anal segment, a little wider than long, 28  $\times$  35  $\mu$ , taking average length as 28  $\mu$ , the ramus being longer ventrally (31  $\mu$ ) than dorsally (25  $\mu$ ). Long naked setule on outer margin 31  $\mu$  long. Outer lateral seta 120  $\mu$  and naked. Outermost terminal seta 180  $\mu$  with lateral spinules. Innermost terminal seta long,  $451 \mu$ , and naked. Two long median terminal setae 460  $\mu$  (outer) and 660  $\mu$  (inner), both with lateral spinules and their "pegged" regions punctate. These 2 setae inserted between ventral flap (with rows of spinules) and dorsal flap of form shown in figure and bearing very small spinules near pedicellate dorsal seta (33  $\mu$  long and naked). Group of 2-3 minute hairs on dorsal surface of ramus.

Dorsal surface of prosome with only a few hairs. Dorsal surface of urosome with more abundant hairs as in Pl. 6, fig. 50; ventral surface with very few hairs. Ratio of length of prosome to that of urosome 2.45: I.

Egg sac (Pl. 6, fig. 49) elongated and rather stout, about  $810 \times 300 \,\mu$ , more than twice as long as the urosome, and containing many eggs about 52  $\mu$  in diameter.

Rostral area (Pl. 7, fig. 52) rather pointed.

First antenna with armature as in S. kossmanni and S. affinis. All setae apparently naked. Lengths of segments (measured as before) 30 (67  $\mu$  along anterior edge), 107, 29, 53, 46, 23, and 15  $\mu$  respectively. Terminal aesthete and adjacent seta with common base. Sclerite on ventral surface of third segment. Long terminal seta 234  $\mu$  in length, distinctly less than length of antenna (340  $\mu$ ).

Second antenna (Pl. 7, fig. 53) 3-segmented, third segment showing no evidence of division. Armature I; I; 3+5+I claw, as in 2 previous species. Seta on

segment I unusually long (165  $\mu$ ) and setose. Seta on segment 2 relatively short (44  $\mu$ ) and naked. Claw 68  $\mu$  along its axis. On anterior surface near base of claw a short vermiform protrusion (aesthete?). Anterior surface of second antenna pilose as in figure.

Labrum (Pl. 7, fig. 54) with attenuated unornamented lobes.

Mandible (Pl. 7, fig. 55) with elements of outer row beginning as stout spines and diminishing to slender spinules; first element in inner row not much larger than rest; a patch of spinules on posterior proximal surface of mandible. Paragnath a small lobe as in S. affinis. First maxilla with 4 elements as in 2 previous species, but ornamented spiniform element only very finely spinulose. Second maxilla (Pl. 7, fig. 56) with first segment ornamented with a few spinules on both anterior and posterior surfaces and with its proximal ventral margin angularly produced. Second segment with postero-inner finely barbed seta, long inner spiniform seta with its posterior surface spinulose but anterior surface smooth, and with terminal spiniform process spinulose and showing 2 prominent spines near base. Maxilliped (Pl. 7, fig. 57) with first segment unarmed, second with usual 2 setae and with spinules as in figure, and third with 2 setae (one spinulose, other naked) and terminal spiniform process.

Area between maxillipeds and first pair of legs not protuberant and resembling that in S. kossmanni.

Rami of legs I-4 like those in 2 previous species, with same spine and setal formula. Fine ornamentation much like that in S. kossmanni. Last segment of endopod of leg 2 without a bifurcated spinous process (Pl. 7, fig. 58), and having a form somewhat different from that in S. kossmanni. Last segment of endopod of leg 3 (Pl. 7, fig. 59) of a form slightly different from S. kossmanni. Leg 4 (Pl. 7, fig. 60) with inner seta on coxa relatively short (26  $\mu$ ) and naked. Slightly barbed inner seta on second segment of exopod shorter than setae on third segment, recurved, and lying (in alcoholized specimens) over the posterior surface of ramus. Endopod (Pl. 8, fig. 61) with 2 segments clearly separated. First segment 31 × 28  $\mu$ , with inner seta 58  $\mu$  long and feathered. Second segment 69  $\mu$  long, 28  $\mu$  in greatest width, and 18  $\mu$  wide at narrowest point, its feathered inner seta 74  $\mu$ , inner terminal spine 76  $\mu$  with finely serrated lamellae and with a delicately trifurcate tip. Row of hairs on outer margin of this segment interrupted at slight indentation.

Leg 5 (Pl. 8, fig. 62) with free segment swollen on inner margin, its greatest dimensions 39  $\times$  19  $\mu$ . Two terminal naked setae extremely unequal, inner 34  $\mu$ , outer 170  $\mu$ . Seta on body near insertion of free segment about 35  $\mu$  and feathered.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 6, fig. 50).

Colour in life in transmitted light translucent to grayish, eye red, egg sacs gray.

MALE. Body (Pl. 8, fig. 63) with prosome more slender than in female. Length (without ramal setae) 0.73 mm. (0.72-0.73 mm.) and greatest width 0.29 mm. (0.28-0.29 mm.), based on 3 specimens (allotype, I paratype, and I specimen collected 14th December, 1963). Ratio of length to width of prosome 1.62: I.

Segment of leg 5 (Pl. 8, fig. 64)  $46 \times 79 \,\mu$ . Ventral intersegmental sclerite absent. Genital segment a little longer than wide,  $125 \times 104 \,\mu$ , with sides in dorsal view nearly parallel. Three postgenital segments  $42 \times 69$ ,  $33 \times 55$ , and  $20 \times 53 \,\mu$  from anterior to posterior.

Caudal ramus like that of female. Surfaces of prosome and urosome, as in female, sparsely ornamented with hairs. Ratio of length of prosome to that of urosome 1.70:1.

Rostral area, first antenna, second antenna, labrum, mandible, paragnath, and first maxilla resembling those in female. Second maxilla much like that of female, with same process on first segment, but with long inner seta less strongly developed and with terminal spiniform process weaker and showing near base only r prominent spine, the second being greatly reduced in size. Maxilliped (Pl. 8, fig. 65) slender. Spinules on second segment arranged differently than in 2 previous species. Claw 117  $\mu$  long (measured along its axis) and showing 2 slight flexures, with only indication of division being an interruption in fringe of delicate hyaline spinules along concave margin. Two setae near base of claw 67  $\mu$  (with a few barbs near tip) and 8  $\mu$  (naked).

Area between maxillipeds and first pair of legs resembling that of female.

Legs 1-4 resembling those of female, with same spine and setal formula.

Leg 5 (Pl. 8, fig. 66) with free segment lacking inner swelling,  $18 \times 9 \mu$ . Two terminal setae 20  $\mu$  (inner) and 58  $\mu$  (outer), ratio between them being 2.9:1, instead of 7:1 as in female. Seta on body near insertion of free segment about 20  $\mu$  long and slightly feathered.

Leg 6 (see Pl. 8, fig. 64) resembling that of S. kossmanni, with a minute spinous process and 2 unequal setae, one naked (64  $\mu$ ), other feathered (20  $\mu$ ).

Spermatophores not observed.

Colour in life in transmitted light as in female.

(The specific name *longiseta*, Latin = long seta, alludes to the unusually long terminal seta on the fifth leg in the female).

Comparison with related species. From the four species of *Stellicola* known to have two postgenital segments in the female,  $S.\ longiseta$  may readily be separated by its very long seta on leg 5. In addition, this species from Mithrodia has a caudal ramus which is a little wider than long, instead of 4:r as in  $S.\ gracilis$  (Thompson & A. Scott, 1903), about 2:r as in  $S.\ lankensis$  (Thompson & A. Scott, 1903), and  $6\cdot 3:r$  or 7:r as in  $S.\ affinis$ . The female of the species from Madagascar whose description by Humes and Ho is in press, although having a nearly quadrate caudal ramus, differs from  $S.\ longiseta$  in having a rounded rostrum, in the seta on the first segment of the second antenna being not unusually long, in the two setae on the endopod of leg 4 being finely barbed instead of feathered, in the two terminal setae on leg 5 having a ratio of 3:r instead of 7:r, and in the ratio of the length of the prosome to that of the urosome being  $2\cdot 0:r$  instead of  $2\cdot 45:r$ . In the male, the species of Humes and Ho differs from  $S.\ longiseta$  in having the genital segment somewhat tapered anteriorly instead of having nearly parallel sides, and in the claw of the maxilliped being evenly recurved instead of showing two flexures.

From all four of these species S. longiseta may be further distinguished by details in ornamentation of the appendages.

S. longiseta appears to be closest to the species to be described by Humes and Ho, both having a very short caudal ramus and a somewhat similar genital segment in the female.

# Stellicola femineus n. sp.

Pl. 8, fig. 67; Pl. 9, figs. 68-75; Pl. 10, figs. 76-84; Pl. 11, figs. 85-92

Type material. 8 \, 9 \, 3, and I copepodid from I starfish, *Leiaster leachi* Gray, in a depth of 0.5 m., Pte. Mahatsinjo, Nosy Bé, Madagascar. Collected 8th August, 1960. Holotype female, allotype, and II paratypes (5 \(\varphi\), 6 \(\delta\)) deposited in the British Mus. (Nat. Hist.) Reg. No. 1966.12.7.10-12, and the remaining paratypes in the collection of A. G. Humes.

Other specimens. 49,93 from I starfish, Leiaster speciosus von Martens, in 0.5 m., Pte. Ambarionaomby, Nosy Komba, near Nosy Bé, Madagascar, 2nd October, 1960.

Female. Body (Pl. 8, fig. 67) with broad flattened prosome. Length (not including setae on caudal rami) 1.41 mm. (1.32-1.49 mm.) and greatest width 0.94 mm. (0.88-0.99 mm.), based on 10 specimens (holotype, 7 paratypes, and 2 specimens from *Leiaster speciosus*). Ratio of length to width of prosome 1.06: 1. Segment of leg 1 completely fused with head. Epimeral areas of segments of legs I and 2 pointed posteriorly; those of segment of leg 3 also pointed but indented as in figure. Segment of leg 4 small, with its tergum and rounded epimeral areas partly overlapped by preceding segment.

Segment of leg 5 (Pl. 9, fig. 68)  $164 \times 257 \mu$ . Intersegmental sclerite not evident. Genital segment broad and flattened, 135  $\times$  239  $\mu$ , wider than long, with expanded rounded lateral margins. Areas of attachment of egg sacs located posteriorly and slightly dorsally; each area (Pl. 9, fig. 69) with 2 unequal feathered setae 34 and 17  $\mu$  in length, each arising from a pedicel. Three postgenital segments 44  $\times$  99,

39  $\times$  89, and 59  $\times$  77  $\mu$  from anterior to posterior.

Caudal ramus (Pl. 9, fig. 70), inserted slightly ventrally, subquadrate, 30  $\times$  33  $\mu$ , a little wider than long. Long naked setule (55  $\mu$ ) midway on outer margin. Pedicellate dorsal seta 60  $\mu$  and feathered. Outer lateral seta 101  $\mu$  and naked, inserted close to outermost terminal seta (208  $\mu$  with straight lateral spinules). Innermost terminal seta 234  $\mu$  with straight lateral spinules. Two long terminal setae, inserted between dorsal (smooth) and ventral (with row of minute spinules) flaps, 396  $\mu$  (outer) and 540  $\mu$  (inner) and both with unusually long hairlike recurved lateral spinules.

Dorsal surface of prosome with short hairs. Dorsal and ventral surfaces of urosome with many hairs as shown in Pl. 9, fig. 68. Ratio of length of prosome to that of

urosome 2.32: I.

Egg sac (see Pl. 8, fig. 67) moderately elongated and stout, 682  $\times$  341  $\mu$ , extending far beyond ends of caudal rami, and containing many eggs about 70  $\mu$  in diameter. Rostral area (Pl. 9, fig. 71) prominent, its posterior margin a little truncated.

First antenna (Pl. 9, fig. 72) 7-segmented, lengths of segments (measured along their posterior non-setiferous margins) being 46 (35  $\mu$  along anterior margin), 107, 34, 36, 25, 13, and 12  $\mu$  respectively. Formula for armature as in 3 previous species. Certain setae with short hairs as in figure. Ventral sclerite on third segment. Long terminal seta 203  $\mu$  in length, distinctly less than length of antenna (270  $\mu$ ).

Second antenna (Pl. 9, fig. 73) 3-segmented, 495  $\mu$  in length, with no evidence of division in segment 3. Armature I; I; 3+5+I claw as in 3 previous species. Third segment elongated, 300  $\mu$  along outer edge, I87  $\mu$  along inner edge, with a sclerotized strongly bent pointed process near base of claw (Pl. 9, fig. 74). Claw 96  $\mu$  along its axis. All setae naked.

Labrum (Pl. 9, fig. 75) with moderately rounded unornamented lobes.

Mandible (Pl. 10, fig. 76) in general resembling that of *S. longiseta* but without proximal patch of spinules. Paragnath (see Pl. 9, fig. 71) a small lobe. First maxilla (Pl. 10, fig. 77) with 4 elements. Second maxilla (Pl. 10, fig. 78) showing second segment with long inner spiniform seta bearing a row of spinules, those in middle of row much longer and stronger; terminal spiniform process with a single large tooth-like proximal spine (2 such spines seen on left second maxilla in 1 female). Maxilliped (Pl. 10, fig. 79) with first segment having a distal patch of spinules, second with 1 naked and 1 feathered seta and rows of spinules as in figure, and third with 2 small unequal setae and terminal spiniform process.

Area between maxillipeds and first pair of legs not protuberant and formed as in Pl. 9, fig. 71.

Rami of legs I-4 (Pl. Io, figs. 80, 81, 82, and 83) like those in 3 previous species with same spine and setal formula. Endopods of legs I-3 rather elongated; last segment of endopod of leg 2 without a bifurcated spinous process. In leg 4 coxa with inner seta apparently reduced to a mere vestige. Feathered inner seta on second segment of exopod short and lying free of ramus. Endopod (Pl. Io, fig. 84) slender, 2 segments clearly separated. First segment  $38 \times 15.5 \,\mu$  with its inner seta short,  $30 \,\mu$ , and finely barbed distally. Second segment  $50 \times 12 \,\mu$  (greatest dimensions), its feathered inner seta  $52 \,\mu$ , inner terminal spine  $76 \,\mu$ , and outer terminal spine  $31 \,\mu$ , both spines finely barbed. (In another female first segment  $33 \times 20 \,\mu$ , and second segment  $58 \times 14.5 \,\mu$ ). Marginal hairs on segments as in figure.

Leg 5 (Pl. II, fig. 85) with elongated slightly recurved slender free segment,  $71 \times 22 \mu$  (greatest dimensions), tapering slightly distally. Two terminal setae naked and very unequal, inner 22  $\mu$ , outer II3  $\mu$ . Seta on body near insertion of free segment about 48  $\mu$  and feathered.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 9, fig. 69).

Colour in life in transmitted light orange-red to deep red, eye red, egg sacs red.

MALE. Body (Pl. 11, fig. 86) with broad flattened prosome as in female. Length (excluding setae on caudal rami) o·85 mm. (o·82–o·88 mm.) and greatest width o·48 mm. (o·46–o·49 mm.), based on 10 specimens (allotype, 8 paratypes, and 1

specimen from *Leiaster speciosus*). Ratio of length to width of prosome I·II: I. Segment of leg 5 completely fused dorsally with genital segment (Pl. II, fig. 87), and only a faint indication of separation between these 2 segments ventrally; segment of leg 5 and genital segment combined a little longer than wide, 22I  $\times$  195  $\mu$ . No intersegmental sclerite. Four postgenital segments 28  $\times$  68, 27  $\times$  62, 24  $\times$  57, and 29  $\times$  52  $\mu$ , from anterior to posterior.

Caudal ramus similar to that of female but smaller,  $18 \times 21 \mu$ .

Surfaces of prosome and urosome, as in female, ornamented with hairs. Ratio of length of prosome to that of urosome 1.73:1.

Rostral area, first antenna, and second antenna as in female. Labrum (Pl. 11, fig. 88) with 2 lobes apparently somewhat more pointed than in female. Mandible, paragnath, first maxilla, and second maxilla like those of female. Maxilliped (Pl. 11, fig. 89) without long terminal claw, but instead having a form rather like that of female. First segment without ornamentation, second with 2 small naked setae (one hyaline and with a blunt tip) and bearing a patch of spinules, and third with one of 2 setae at base of naked terminal spiniform process greatly elongated.

Area between maxillipeds and first pair of legs as in female.

Legs I-4 resembling in major features those of female, having same spine and setal formula. In legs 2 and 3 apparently a slight sexual dimorphism in lengths of 3 spines on last segment of endopod (from proximal to distal in leg 2 of male 12, 13, and 24  $\mu$ , but in female 22, 2I, and 34  $\mu$ ; in leg 3 of male 12, I3, and 25  $\mu$ , but in female 23, 24, and 40  $\mu$ ). Dimensions of endopod of leg 4: first segment 22  $\times$  I3  $\mu$ , with its seta 2I  $\mu$ ; second segment 3I  $\times$  II  $\mu$ , with its seta 34  $\mu$  and spines 50  $\mu$  (inner) and 24  $\mu$  (outer).

Leg 5 (Pl. II, fig. 90) with rectangular free segment relatively shorter than in female, 19  $\times$  9  $\mu$ , with 2 terminal setae 16  $\mu$  (inner) and 56  $\mu$  (outer), with ratio of 3.5: I, instead of 5: I as in female. Seta on body near insertion of free segment about 22  $\mu$  long and feathered.

Leg 6 (Pl. 11, fig. 91) consisting of a posterolateral flap on ventral surface of genital segment and bearing at either side of a small spinous process 2 slender naked setae 46 and 29  $\mu$  long.

Spermatophore, observed only inside body of male, of elongated form (Pl. 11, fig. 92).

Colour in life in transmitted light paler orange-red than in female, eye red.

(The specific name *femineus*, Latin = womanly or feminine, alludes to the weakly prehensile, female-like maxilliped in the male of this species).

Comparison with related species. The female of S. femineus differs from almost all other known species in the genus in having the free segment of leg 5 at least three times longer than wide. The only species which has similar proportions in leg 5 is the species of Humes and Ho (in press) where the free segment is  $65 \times 21 \mu$ . In this species, however, there are only two postgenital segments in the female.

The male of *S. femineus* is unique in the genus in having a female-like maxilliped, without a well-formed prehensile claw.

# Stellicola pollex n. sp.

Pl. 11, fig. 93; Pl. 12, figs. 94-101; Pl. 13, figs. 102-109; Pl. 14, figs. 110-114.

Type material. 5  $\circ$  and 4  $\circ$  from 2 starfishes, *Linckia laevigata* (L.), in a depth of 10 m., at Nosy Ovy (=Berafia), 13° 59′ S, 47° 46′ 30″ E, to the southwest of Nosy Bé, Madagascar. Collected 1st October, 1964. Holotype, allotype, and 5 paratypes (3  $\circ$ , 2  $\circ$ ) deposited in the British Mus. (Nat. Hist.) Reg. No. 1966.12.7.13–15, and the remaining 2 paratypes (dissected) in the collection of A. G. Humes.

FEMALE. Body (Pl. II, fig. 93) with broad flat prosome. Length (without setae on caudal rami) 0.99 mm. (0.94–I.03 mm.) and greatest width 0.78 mm. (0.68–0.88 mm.), based on 5 specimens. Ratio of length to width of prosome 0.95: I, prosome being slightly wider than long. Segment of leg I separated dorsally and laterally from head by a distinct furrow. Epimera of metasomal segments as in S. femineus.

Segment of leg 5 (Pl. 12, fig. 94) 91  $\times$  180  $\mu$ . Ventrally between this segment and genital segment a very short intersegmental sclerite. Genital segment broad and flattened, 161  $\times$  198  $\mu$ , wider than long, with expanded rounded lateral margins lobed posteriorly. Areas of attachment of egg sacs located ventrally and hidden in dorsal view by the lobes; each area (Pl. 12, fig. 95) with 2 naked setae, 39 and 35  $\mu$  in length, borne on pedicels. Three postgenital segments 35  $\times$  64, 36  $\times$  62, and 34  $\times$  57  $\mu$  from anterior to posterior.

Caudal ramus (Pl. 12, fig. 96), inserted ventrally, quadrate,  $20 \times 20 \mu$ , with naked setule on outer margin 19  $\mu$  long. Pedicellate dorsal seta 36  $\mu$  and feathered. Outer lateral seta 60  $\mu$  and naked. Outermost terminal seta 127  $\mu$  and innermost 96  $\mu$ , both with lateral spinules. Two long terminal setae, inserted between flaps as in S. femineus, 320  $\mu$  (outer) and 495  $\mu$  (inner), both with short spinules.

Dorsal surface of prosome with scattered hairs (not shown in Pl. II, fig. 93, because of the reduced scale). Dorsal surface of urosome with hairs and refractile points as in Pl. I2, fig. 94; ventral surface with very little ornamentation. Ratio of length of prosome to that of urosome 2.5: I.

Egg sacs not present on any of females collected.

Rostral area as in S. femineus, though posterior margin less truncated.

First antenna (Pl. 12, fig. 97) more slender than in *S. femineus*, but with same segmentation and armature. Lengths of segments (measured as before) 44 (35  $\mu$  along anterior margin), 116, 45, 50, 33, 20, and 16  $\mu$  respectively. One seta on segment 6 and 4 setae on segment 7 with lateral hairs; rest of setae naked. Terminal seta 117  $\mu$ , about one-third length of antenna (330  $\mu$ ).

Labrum as in S. femineus, though lobes a little more rounded.

Mandible (Pl. 12, fig. 99) with slender spinules along outer margin and row of dentiform spinules along inner margin (proximal spinule enlarged and preceded by

a slight flange). Paragnath (Pl. 12, fig. 100) a small lobe with very slender spinules. First maxilla in general like that of *S. femineus*. Second maxilla (Pl. 12, fig. 101) with first segment unarmed, second with 2 postero-inner elements (a slender barbed seta and a long spiniform seta ornamented with a row of spinules along its distal edge and showing a very weak line of division proximally) and terminating in a spiniform process bearing rows of teeth as in figure. Maxilliped (Pl. 13, fig. 102) resembling in major features that of *S. femineus*, though details of ornamentation somewhat different.

Area between maxillipeds and first pair of legs as in S. femineus.

Rami of legs I-4 (Pl. I3, figs. I03, I04, I05, and I06) segmented as in previous 4 species, with similar spine and setal formula, except for endopod of leg 4 which is 0-0; II. Endopods of legs I-3 rather elongated as in S. femineus; last segment of endopod of leg 2 without a bifurcated spinous process. Leg 4 with only a vestige of inner coxal seta. Inner seta on second segment of exopod short (22  $\mu$ ) and apparently naked. Endopod (Pl. I3, fig. I07) 4I  $\times$  I0  $\mu$ , only incompletely divided into 2 segments, its inner margin entire. Two inner setae usually seen in Stellicola here absent, and only armature of endopod consisting of 2 terminal smooth spines 60  $\mu$  (inner) and 3I  $\mu$  (outer) in length. Rows of hairs along outer and inner margins of endopod, outer row interrupted at incomplete division of ramus.

Leg 5 (Pl. 13, fig. 108) with free segment 55  $\times$  27  $\mu$  (greatest dimensions, its inner proximal margin somewhat irregular and produced). Two terminal setae naked and unequal, inner 43  $\mu$ , outer 56  $\mu$ . Seta on body near insertion of free segment about 37  $\mu$  and slightly feathered.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 12, fig. 95).

Colour in life in transmitted light slightly opaque, eye red, egg sacs gray.

MALE. Body (Pl. 13, fig. 109) resembling that of female. Length (excluding setae on caudal ramus)  $0.55 \, \text{mm}$ . ( $0.53-0.56 \, \text{mm}$ .) and greatest width  $0.36 \, \text{mm}$ . ( $0.35-0.37 \, \text{mm}$ .), based on 4 specimens. Ratio of length to width of prosome 1.07:1.

Segment of leg 5 and genital segment fused (Pl. 14, fig. 110) as in *S. femineus*; these fused segments 127  $\mu$  long, 115  $\mu$  wide just in front of leg 5, and 105  $\mu$  wide behind leg 5. No intersegmental sclerite. Four postgenital segments 28  $\times$  46, 23  $\times$  43, 22  $\times$  40, and 18  $\times$  36  $\mu$  from anterior to posterior.

Caudal ramus similar to that of female but smaller, 12.5  $\times$  13  $\mu$ .

Surfaces of prosome and urosome, as in female, ornamented with hairs. Ratio of length of prosome to that of urosome 2.07: I.

Rostral area and first antenna as in female. Second antenna also resembling that of female, but having a conspicuous thumb-like process on inner margin of third segment (Pl. 14, fig. III). Labrum, mandible, paragnath, first maxilla, and second maxilla like those in female. Maxilliped (Pl. 14, fig. II2) slender, with long terminal claw. First segment unarmed, second with 2 naked setae and 2 patches of spinules, third short and unarmed. Proximal half of claw probably representing fourth segment. Claw only slightly recurved, 130  $\mu$  in length along its axis, showing

faint indication of division about midway, with a fringe of small spinules along its concave margin and 2 unequal setae 8  $\mu$  (naked) and 26  $\mu$  (slightly barbed) near its base.

Area between maxillipeds and first pair of legs as in female.

Legs I-4 resembling those of female, with same spine and setal formula. As in *S. femineus* a slight sexual dimorphism in lengths of 3 spines on last segment of endopod of legs 2 and 3 (from proximal to distal in leg 2 of male 9, 10, and 22  $\mu$ , but in female 16·5, 17·5, and 35  $\mu$ ; in leg 3 of male 8, 10, and 20  $\mu$ , but in female 16·5, 18·5, and 35  $\mu$ ). Dimensions of endopod of fourth leg 22  $\times$  8  $\mu$ , with inner spine 31  $\mu$  and outer spine 17  $\mu$ .

Leg 5 (Pl. 14, fig. 113) with free segment smaller and having nearly parallel sides,  $20 \times 8 \mu$ , the terminal setae 18  $\mu$  (inner) and 52  $\mu$  (outer), with ratio of 2.9:I,

instead of I:3: I as in female.

Leg 6 (Pl. 14, fig. 114) consisting of a posterolateral flap on ventral surface of genital segment and bearing 2 slender naked setae 21 and 36  $\mu$ .

Spermatophores not observed.

Colour in life in transmitted light as in female.

(The specific name *pollex*, Latin = a thumb, refers to the thumb-like process on the third segment of the second antenna of the male).

COMPARISON WITH OTHER SPECIES. S. pollex has two readily observable characters by which it may be distinguished from all other species in the genus, namely, the thumb-like process on the third segment of the second antenna in the male and the armature of the endopod of leg 4 (0-0; II) in both sexes.

In the fifteen previously known species and in the four species described above the formula for the endopod of leg 4 is 0-I; II, I. Such an armature seems to be a stable and constant feature in the genus. The unusual armature in S. pollex might suggest at first glance that this species should be removed to a separate genus. However, other features of S. pollex (first antenna, second antenna, mouthparts, legs I-5, and body form) conform very closely to the pattern of Stellicola. The structure of the mandible (which is an important generic character in the Lichomolgidae) is very much like that in other species of the genus. Therefore, in spite of the rather remarkable difference in the armature of this endopod, we are considering the species to belong to Stellicola.

# Stellicola oreastriphilus Kossmann, 1877

Pl. 14, figs. 115–120

Two females and one male were recovered from washings of a single starfish, *Protoreaster nodosus* (L.), in a depth of 2 m., on *Cymodocea*, at Ambatoloaka, Nosy Bé, 15th October, 1960. This represents a new host record, the species having been previously found on six other starfishes—*Asterope carinifera* (Lamarck) in the Red Sea by Kossmann (1877), on *Protoreaster lincki* (Blainville), *Culcita schmideliana* (Retzius), *Pentaceraster mammillatus* (Audouin), and *Poraster superbus* (Möbius) in Madagascar by Humes & Cressey (1961), and on *Choriaster granulatus* (Lütken) in Madagascar by Humes & Ho (in press).

In connection with the description of the five new species above, specimens of *S. oreastriphilus* (from a lot of approximately 1,000 individuals washed from 200 *Protoreaster lincki*, in a depth of 10 cm., at Pte. Mahatsinjo, Nosy Bé, 6th September, 1964) were restudied. The dissections were done in lactic acid (see Humes & Gooding, 1964), enabling us to see certain details not easily observed in the original dissections in glycerine. Notes on these features are offered here as a supplement to the work of Humes & Cressey (1961).

Female. The flattened genital segment (Pl. 14, fig. 115) expanded laterally, with subparallel lateral margins. A pair of ventral refractile sclerotizations present on sides of segment. Tip of second antenna (Pl. 14, fig. 116) bearing 5 setae and 1 claw. Paragnath (Pl. 14, fig. 117) a hairy lobe bearing a sclerotized process. Maxilliped (Pl. 14, fig. 118) with second segment having 2 setae (one surficial, other on a hyaline base at inner marginal angle) and a crescentic row of spinules; third segment with 2 very unequal small setae at base of terminal spiniform process. Endopod of leg 4 (Pl. 14, fig. 119) with marginal hairs as in figure.

MALE. Segment of leg 5 and genital segment (Pl. 14, fig. 120) fused completely dorsally and their ventral separation suggested by a very indistinct line. Fused segments 120  $\mu$  long, 109  $\mu$  wide just in front of leg 5, and 101  $\mu$  wide posterior to leg 5. (The rather distinct separation of the two segments shown by Humes & Cressey, 1961, fig. 25, is not present in the material which we have re-examined).

# Stellicola caeruleus (Stebbing, 1900)

Pl. 15, figs. 121-128; Pl. 16, figs. 129-134; Pl. 17, figs. 135-141

This species was placed by Stebbing (1900, pp. 664–666, plate LXXIVB) in a new genus *Linckiomolgus*, but, as Stock (1957) has pointed out, and as will be seen from the redescription below, it belongs more properly to *Stellicola*.

Through the kindness of Miss Patricia D. Lofthouse we have been able to study syntypes (I female and I male) of S. caeruleus [Brit. Mus. (Nat. Hist.) reg. no. 1928.12.1.3020]. These are labelled "China Sea on blue Linckia", though the type locality given by Stebbing was Feather Island, China Straits, New Guinea. The dissections of these specimens, mounted on two slides, have been returned to the British Museum (Nat. Hist.). Although the condition of the specimens (which were in amplexus) was less than perfect, with certain setae broken or missing, the major features could be observed in the dissections. Stebbing's original description being inadequate in many respects, especially regarding the mouthparts, a redescription of the species based on syntypic material is desirable.

Female. Body (Pl. 15, fig. 121) with greatly expanded prosome. Length (without setae on caudal rami) 1.23 mm. and greatest width 0.88 mm. Ratio of length to width of prosome 0.97:1, being a little wider than long. Segment of leg I completely fused with head. Epimeral areas of metasomal segments resembling those of S. femineus.

Genital segment (Pl. 15, fig. 122) wider than long, 156  $\times$  208  $\mu$ , broadly rounded laterally in its anterior half and tapering in its posterior half where the areas of

attachment of the egg sacs are located laterally. Dorsally with two longitudinal posterior elevations with sclerotization as in figure. Each egg sac attachment area with 2 unequal setae, one arising from a prominent slender pedicel 31  $\times$  8  $\mu$ . Three postgenital segments 60  $\times$  86, 42  $\times$  78, and 52  $\times$  72  $\mu$  from anterior to posterior.

Caudal ramus (Pl. 15, fig. 123) only a little longer than wide, 32  $\times$  28  $\mu$ .

Ratio of length of prosome to that of urosome 2.32: 1.

Egg sac broken on female examined; an isolated egg about 74  $\mu$  in diameter. Rostral area (Pl. 15, fig. 124) incomplete posteriorly.

First antenna (Pl. 15, fig. 125) 7-segmented, lengths of segments (measured along their posterior non-setiferous margins) being 55 (44  $\mu$  along anterior margin), 113, 39, 43, 33, 15, and 14  $\mu$  respectively. Formula for armature 4, 13 (5 + 2 + 6), 6, 3, 4 + 1 aesthete, 2 + 1 aesthete, and 7 + 1 aesthete, as in all 5 new species described above and as in S. oreastriphilus. Ventral sclerite present on third segment.

Second antenna (Pl. 15, fig. 126) with a single claw 79  $\mu$  along its axis and with armature as in S. femineus. Third segment 166  $\mu$  along outer side, 91  $\mu$  along inner side, with no evidence of division.

Labrum as in Pl. 15, fig. 124.

Mandible (Pl. 15, fig. 127) with first 2 elements of inner row only slightly larger than succeeding ones. Paragnath a small lobe with coarse hairs. First maxilla with 4 elements. Second maxilla (Pl. 15, fig. 128) with second segment with long inner spiniform seta bearing a row of spinules, those in middle of row somewhat longer; terminal spiniform process with strong graduated teeth. Maxilliped (Pl. 16, fig. 129) 3-segmented, with second segment apparently having only 1 seta, and with 2 very unequal spinules near base of short terminal claw-like process.

Area between maxillipeds and first pair of legs resembling that of S. femineus. Rami of legs 1-4 (Pl. 16, figs. 130, 131, 132, and 133) segmented and armed as in S. kossmanni, S. affinis, S. longiseta, and S. femineus, except for last segment of exopod of leg 3 which has formula of II, I, 5. In leg 4 coxa with only a minute knob probably representing a vestige of inner coxal seta seen in other species. Inner seta on second segment of exopod 25  $\mu$  long and naked. Endopod 2-segmented, 2 segments distinctly separated. First segment 27  $\times$  15  $\mu$ , with its inner seta 36  $\mu$  and finely barbed. Second segment 31  $\times$  12  $\mu$ , its inner seta 42  $\mu$  and feathered, inner terminal spine 66  $\mu$  and barbed, outer spine 29  $\mu$  with only a few minute barbs. (Marginal hairs on endopod segments not discernible).

Leg 5 (Pl. 16, fig. 134) with free segment about 44  $\times$  17  $\mu$ , bearing 2 very unequal terminal setae.

Leg 6 probably represented by the 2 setae on area of attachment of egg sac (see Pl. 15, fig. 122).

MALE. Body (Pl. 17, fig. 135) with prosome somewhat less expanded than in female. Length (excluding ramal setae) 0.52 mm. and greatest width 0.32 mm. Ratio of length to width of prosome 1.09:1, being a little longer than wide.

Segment of leg 5 fused with genital segment (Pl. 17, fig. 136), as in S. femineus, S. pollex, and S. oreastriphilus. These 2 segments combined longer than wide: 110  $\mu$  in length, 83  $\mu$  wide at level of fifth legs, and 75  $\mu$  wide posterior to these

legs, where lateral margins are subparallel. Four postgenital segments 30  $\times$  47, 30  $\times$  44, 20  $\times$  40, and 22  $\times$  37  $\mu$  from anterior to posterior.

Caudal ramus similar to that of female but smaller, 19  $\times$  15  $\mu$ .

Ratio of length of prosome to that of urosome 2.05:1.

Rostral area (Pl. 17, fig. 137) well-defined posteriorly, with its border there slightly indented.

First antenna, second antenna, labrum, mandible, paragnath, and first maxilla like those of female. Second maxilla (Pl. 17, fig. 138) with second segment much like that of female, but with first segment showing 3 peculiar sclerotized processes arising ventrally. (Possibly these are adhesive pads). Maxilliped (Pl. 17, fig. 139) small, 2-segmented, with terminal claw 22  $\mu$  along its axis. Both segments without ornamentation or armature; a small knob on basal area of claw.

Legs 1-4 like those in female, with same spine and seta formula.

Leg 5 (Pl. 17, fig. 140) with a small free segment, 12  $\times$  7  $\mu$ , bearing 2 terminal setae 18  $\mu$  (inner) and 55  $\mu$  (outer).

Leg 6 (Pl. 17, fig. 141) consisting of the usual posterolateral flap on ventral surface of genital segment and bearing 2 unequal setae.

Spermatophores not observed.

Comparison with other species. Based on our study of syntypes, *S. caeruleus* shows three features not found in the other nineteen species of the genus, as far as known: the two posterior sclerotized elevations on the dorsal surface of the genital segment of the female, the three peculiar sclerotized processes on the first segment of the second maxilla in the male, and the formula of II, I, 5 on the last segment of the exopod of leg 3 in both sexes. A small 2-segmented maxilliped with a short claw is also found in the male of *S. holothuriae* (Ummerkutty), but this Indian species differs from *S. caeruleus* in having the formula III, I, 5 on the last segment of the exopod in leg 3 and in the shape of the caudal ramus (much wider than long). *S. caeruleus* may thus readily be distinguished from other members of the genus.

# NOTES ON THE VARIABILITY OF CERTAIN FEATURES IN THE GENUS STELLICOLA

The twenty species here recognized in the genus *Stellicola* exhibit certain variations in external structure worthy of note. The second antenna may bear terminally a single claw, two claws, or three claws. Those with three claws are the four West African species: *S. frequens*, *S. astropectinis*, *S. luidiae*, and *S. lautus*. (In all of these the middle spine on the last segment of the endopod of leg 2 is unusually short, whereas in other species, as far as known, this spine is not thus shortened; the second segment of the endopod of leg 4 has a sharp spinous process midway on its outer margin opposite the inner seta). The only species with two claws is *S. clausi*. The remaining fifteen species have a single claw. The third segment of the second antenna in some species may show an incomplete division (as in the species to be described by Humes and Ho, in press, and in *S. kossmanni*).

The armature of legs r-4 is similar in all species (where it has been described)

The armature of legs 1-4 is similar in all species (where it has been described) except for S. caeruleus, where the formula for the last segment of the exopod of leg 3 is II, I, 5, and S. pollex, where the endopod of leg 4 has a formula of 0-0; II.

In a few species the basis of leg 4 is greatly elongated and the inner coxal seta is absent, this seta being perhaps represented by a small knob, as in S. femineus, S. pollex, and S. caeruleus. S. thorelli, S. pleurobranchi, S. curticaudatus, S. longicaudatus, and S. holothuriae appear to be similarly constructed, but the exact nature of the protopodal segments of leg 4 is impossible to determine from the descriptions and figures of these species. S. oreastriphilus represents an intermediate form between those species with an elongated basis and those with a short basis (as in S. kossmanni, for example).

The maxilliped of the male in most species is elongated and bears a long prehensile claw, but in *S. femineus* it is female-like and only weakly prehensile, and in *S.* 

caeruleus it is small, 2-segmented, with a short claw.

The second maxilla of the male of *S. caeruleus* is remarkable in the development of three peculiar sclerotized processes on the first segment. In most other species, as far as known, there is no sexual dimorphism in this appendage, but in *S. longiseta* and *S. affinis* the second maxilla of the male shows slight differences from that of the female.

In the males of certain species the segment of leg 5 and the genital segment are almost completely fused, as in S. oreastriphilus, S. femineus, S. pollex, and S. caeruleus. It may be noted that the tendency in leg 4 toward elongation of the basis and loss of the inner coxal seta occurs in the same four species.

The males of five species (S. thorelli, S. pleurobranchi, S. lankensis, S. curticaudatus, and S. longicaudatus) are unknown, and the available descriptions of the females are lacking in detail. Hence, it is impossible at present to determine whether or not these variations exist in them.

The significance of such variations as mentioned above is not clear. The four West African species seem to be closely related and set apart from the rest, perhaps constituting an evolutionary line within the genus. It will be necessary, however, to have much more information on the species within the genus before well-founded conclusions regarding evolutionary relationships can be made. Undoubtedly many more species of *Stellicola* remain to be discovered, since relatively few species of potential asteroid hosts have been examined.

#### KEYS TO THE SPECIES OF STELLICOLA

The preparation of keys for the identification of the species of *Stellicola* presents certain difficulties, since detailed information regarding various structures in several species is not available in the existing descriptions or figures. Furthermore, the males of five species (thorelli, pleurobranchi, lankensis, curticaudatus, and longicaudatus) are unknown and consequently cannot be included in the key. The keys given here are entirely artificial and are presented only as aids in identification. Final determination of a species should be made by reference to the original descriptions and figures, or to actual specimens, if available.

#### FEMALES

1	Two postgenital segments			2
	Three postgenital segments			6
2	Caudal ramus $2 \times$ or more than $2 \times$ longer than wide.			3
	Caudal ramus short nearly quadrate			5

13	Radio of body length to with about 120.1
	Ratio of body length to width about 1.5:1
16	Two setae on free segment of leg 5 about equal in length
	Two setae on free segment of leg 5 distinctly unequal in length
17	Basis of leg 4 greatly elongated, ratio of its length to length of exopod about 13.5:5
	pleurobranchi
	Basis of leg 4 not as elongated, ratio of its length to length of exopod about 9:5
	oreastriphilus
18	Postgenital segments and caudal rami together more than 4× as long as genital
	segment

	segment or shorter	than	that se	egmer	ıt .							
19	Postgenital segments	and	caudal	rami	together	a	little	longer	than	genital	segmer	ıt
											curtica	1111

Postgenital segments and caudal rami together only a little longer than genital

Postgenital segments and caudal rami together a little shorter than genital segment holothuriae

19

#### MALES

Three postgenital segments

-	Tinec postgenital segments .	•	•	•	•	•	•	•	•		
	Four postgenital segments .		•		•	•	•	•			5
2	Caudal ramus distinctly elongated						•	•	•	•	3
	Caudal ramus nearly quadrate					•	•	•	•	٠	4

3	Caudal ramus $7.5 \times$ longer than wide affinis
	Caudal ramus about 4× longer than wide gracilis
4	Caudal ramus slightly longer than wide; claw of maxilliped evenly recurved; free
	segment of leg 5 nearly 4× longer than wide . species of Humes and Ho, in press
	Caudal ramus a little wider than long; claw of maxilliped with 2 slight flexures;
	free segment of leg 5 about 2× longer than wide longiseta
5	With more than I claw on last segment of second antenna 6
,	With only I claw on last segment of second antenna
6	With 3 claws on last segment of second antenna
	With 2 claws on last segment of second antenna
7	Length less than 1 mm.; free segment of leg 5 about 24–25 $\times$ 12 $\mu$ 8
1	Length somewhat more than 1 mm.; free segment of leg 5 about 36–38 $\times$ 17 $\mu$ . 9
8	Caudal ramus a little longer than wide, ratio about 1.3:1 frequens
	Caudal ramus more elongated, ratio about 2·1:1 astropectinis
Q	Caudal ramus somewhat elongated, ratio about 1.6:1 luidiae
	Caudal ramus more elongated, ratio about 2·2: I lautus
10	With thumb-like process on third segment of second antenna; formula of endopod
	of fourth leg o-o; II pollex
	Without thumb-like process on third segment of second antenna; formula of endo-
	pod of fourth leg o-I; II, I
II	Maxilliped not elongated, 2- or 3-segmented, with relatively short claw 12
	Maxilliped elongated, 4-segmented, with long prehensile claw
12	Maxilliped small, 2-segmented, with relatively small but distinctly prehensile claw
	Maxilliped female-like, 3-segmented, with terminal spiniform process instead of a claw
	femineus
13	First segment of second maxilla with 3 peculiar sclerotized processes . caeruleus
-3	First segment of second maxilla without such processes holothuriae
14	Segment of leg 5 and genital segment separated
-4	Segment of leg 5 and genital segment almost completely fused . oreastriphilus

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#### EXPLANATION OF FIGURES

All figures were drawn with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn.

Abbreviations used:  $A_1$  = first antenna,  $A_2$  = second antenna, MD = mandible, P = paragnath,  $MX_1$  = first maxilla,  $MX_2$  = second maxilla, MXPD = maxilliped,  $P_1$  = leg r.

#### Stellicola kossmanni n. sp., female

Fig. 1. Dorsal (A).

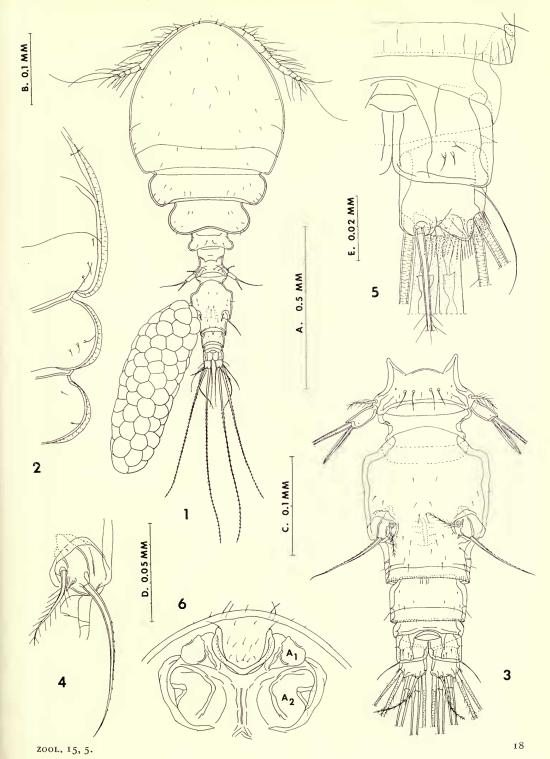
Fig. 2. Marginal membrane on prosomal segments, dorsal (B).

Fig. 3. Urosome, dorsal (c).

Fig. 4. Area of attachment of egg sac, dorsal (D).

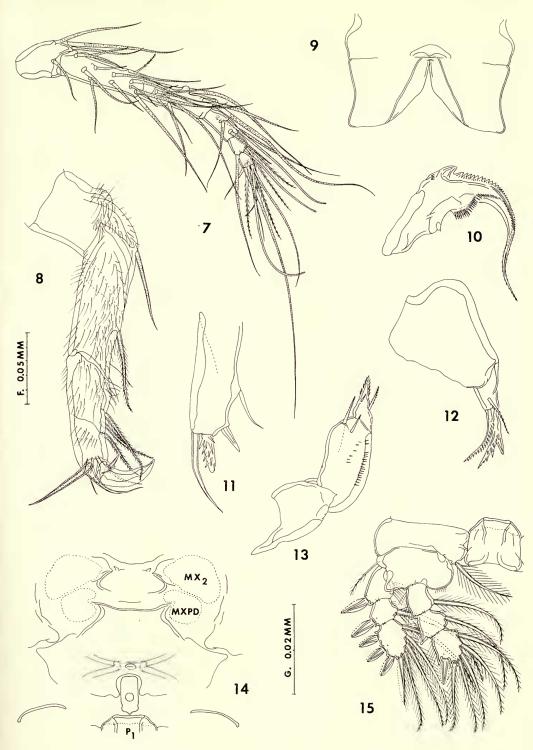
Fig. 5. Caudal ramus and part of anal segment, dorsal (E).

Fig. 6. Rostral area, ventral (c).



#### Stellicola kossmanni n. sp., female (continued)

- Fig. 7. First antenna, anterodorsal (c).
- Fig. 8. Second antenna, anterior (F).
- Fig. 9. Labrum, ventral (D).
- Fig. 10. Mandible, posterior (D).
- Fig. 11. First maxilla, posterolateral (G).
- Fig. 12. Second maxilla, posterior (D).
- Fig. 13. Maxilliped, anterior (D).
- Fig. 14. Area between maxillipeds and first pair of legs, ventral (c).
- Fig. 15. Leg 1 and intercoxal plate, anterior (c).



# Stellicola kossmanni n. sp., female (continued)

Fig. 16. Leg 2, anterior (c).

Fig. 17. Leg 3, anterior (c).

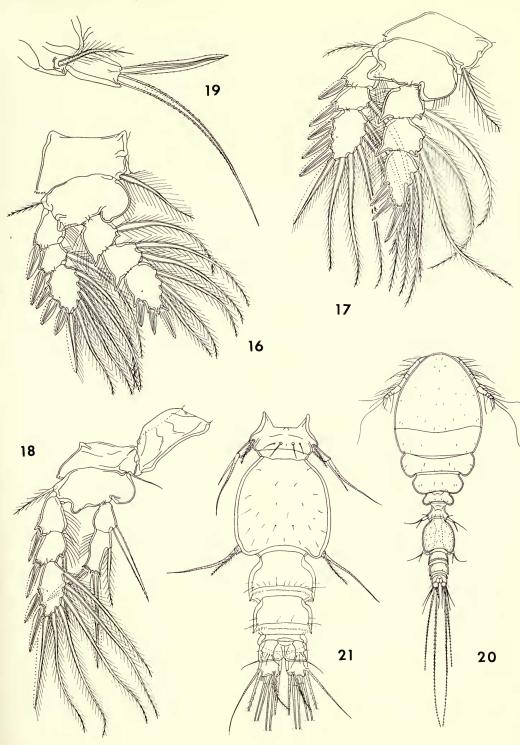
Fig. 18. Leg 4 and intercoxal plate, anterior (c).

Fig. 19. Leg 5, dorsal (D).

Stellicola kossmanni n. sp., male

Fig. 20. Dorsal (A).

Fig. 21. Urosome, dorsal (c).

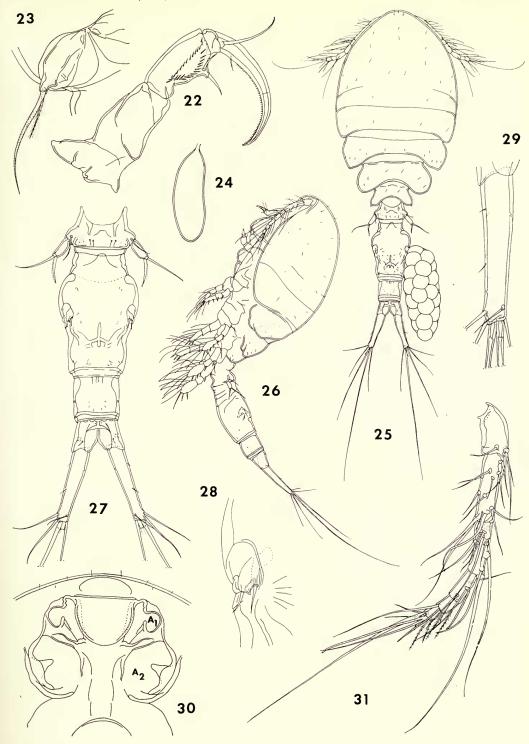


#### Stellicola kossmanni n. sp., male (continued)

- Fig. 22. Maxilliped, anterior (F).
- Fig. 23. Leg 6, ventral (F).
- Fig. 24. Spermatophore, in body of male, dorsal (c).

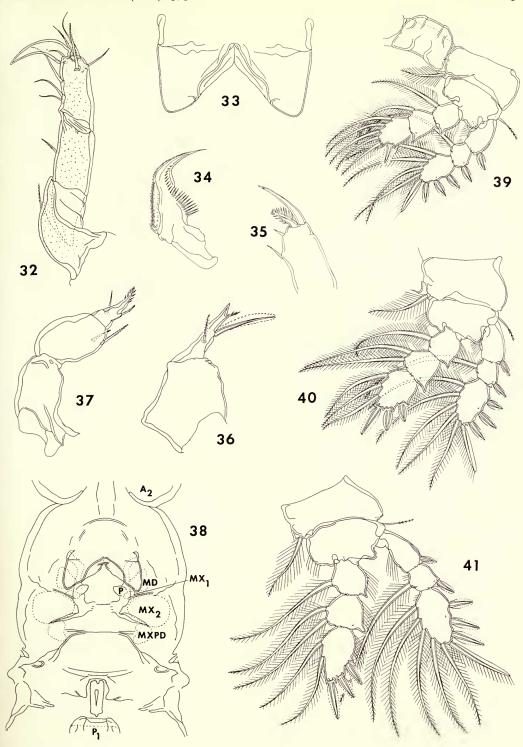
#### Stellicola affinis n. sp., female

- Fig. 25. Dorsal (A).
- Fig. 26. Lateral (A).
- Fig. 27. Urosome, dorsal (B).
- Fig. 28. Area of attachment of egg sac, dorsal (D).
- Fig. 29. Caudal ramus, dorsal (F).
- Fig. 30. Rostrum, ventral (c).
- Fig. 31. First antenna, anterodorsal (c).



# Stellicola affinis n. sp., female (continued)

- Fig. 32. Second antenna, posterior (F).
- Fig. 33. Labrum, ventral (D).
- Fig. 34. Mandible, posterior (D).
- Fig. 35. First maxilla, posterior (E).
- Fig. 36. Second maxilla, posterior (D).
- Fig. 37. Maxilliped, posterior (D).
- Fig. 38. Oral and postoral areas, ventral (c).
- Fig. 39. Leg I and intercoxal plate, anterior (c).
- Fig. 40. Leg 2, anterior (c).
- Fig. 41. Leg 3, anterior (c).



## Stellicola affinis n. sp., female (continued)

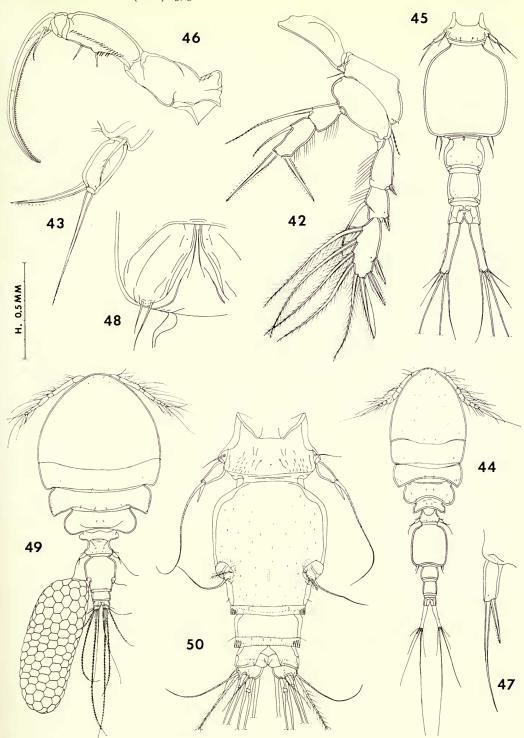
- Fig. 42. Leg 4 and intercoxal plate, anterior (c).
- Fig. 43. Leg 5, dorsal (D).

## Stellicola affinis n. sp., male

- Fig. 44. Dorsal (A).
- Fig. 45. Urosome, dorsal (B).
- Fig. 46. Maxilliped, anterior (F).
- Fig. 47. Leg 5, ventral (D).
- Fig. 48. Leg 6, ventral (F).

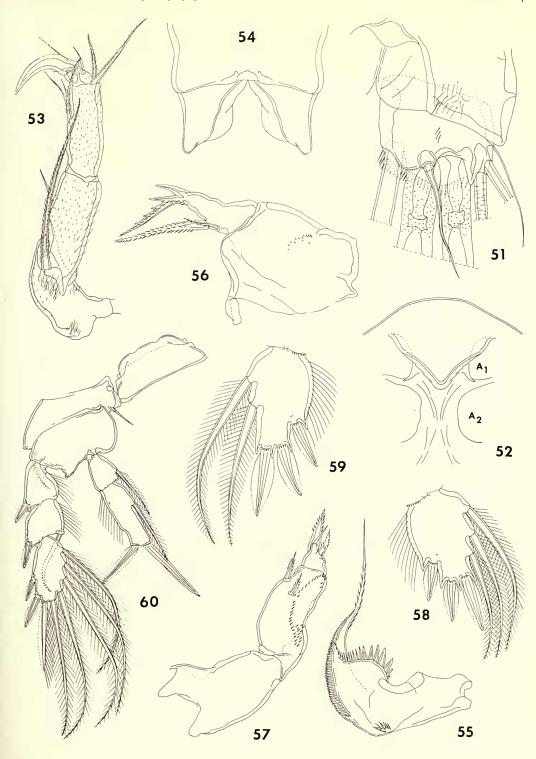
## Stellicola longiseta n. sp., female

- Fig. 49. Dorsal (H).
- Fig. 50. Urosome, dorsal (B).



# Stellicola longiseta n. sp., female (continued)

- Fig. 51. Caudal ramus, dorsal (E).
- Fig. 52. Rostrum, ventral (c).
- Fig. 53. Second antenna, anterior (F).
- Fig. 54. Labrum, ventral (F).
- Fig. 55. Mandible, posterior (D).
- Fig. 56. Second maxilla, posterior (D).
- Fig. 57. Maxilliped, anterior (D).
- Fig. 58. Last segment of endopod of leg 2, anterior (F).
- Fig. 59. Last segment of endopod of leg 3, anterior (F).
- Fig. 60. Leg 4 and intercoxal plate, anterior (c).



## Stellicola longiseta n. sp., female (continued)

Fig. 61. Endopod of leg 4, anterior (F).

Fig. 62. Leg 5, dorsal (D).

Stellicola longiseta n. sp., male

Fig. 63. Dorsal (A).

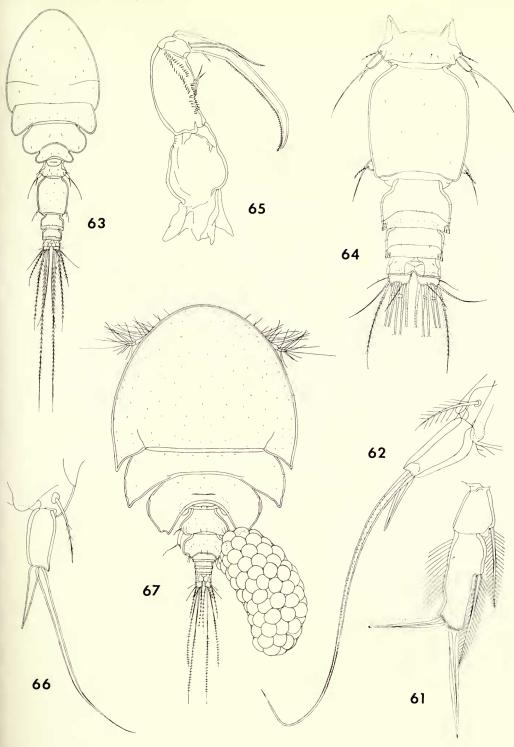
Fig. 64. Urosome, dorsal (c).

Fig. 65. Maxilliped, anterior (F).

Fig. 66. Leg 5, dorsal (E).

Stellicola femineus n. sp., female

Fig. 67. Dorsal (H).



## Stellicola femineus n. sp., female (continued)

Fig. 68. Urosome, dorsal (1).

Fig. 69. Area of attachment of egg sac, dorsal (F).

Fig. 70. Caudal ramus, dorsal (E).

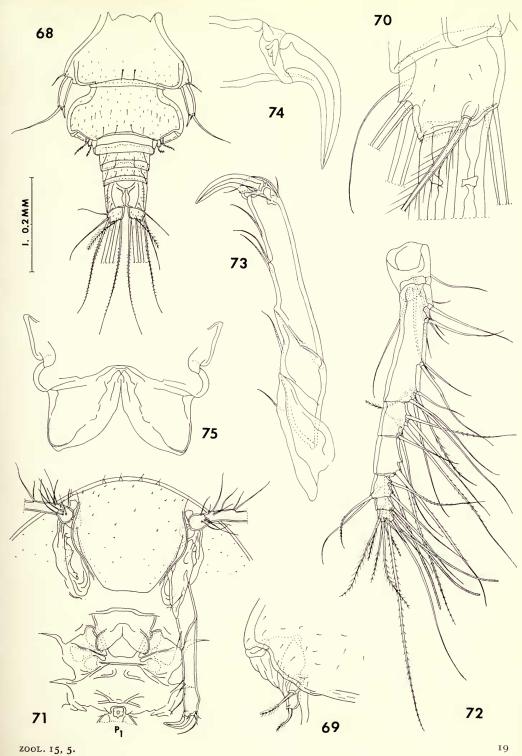
Fig. 71. Rostrum, oral and postoral areas, mouthparts not labelled but in same relative positions as in Plate 5, fig. 38, ventral (A).

Fig. 72. First antenna, dorsal (c).

Fig. 73. Second antenna, posterior (B).

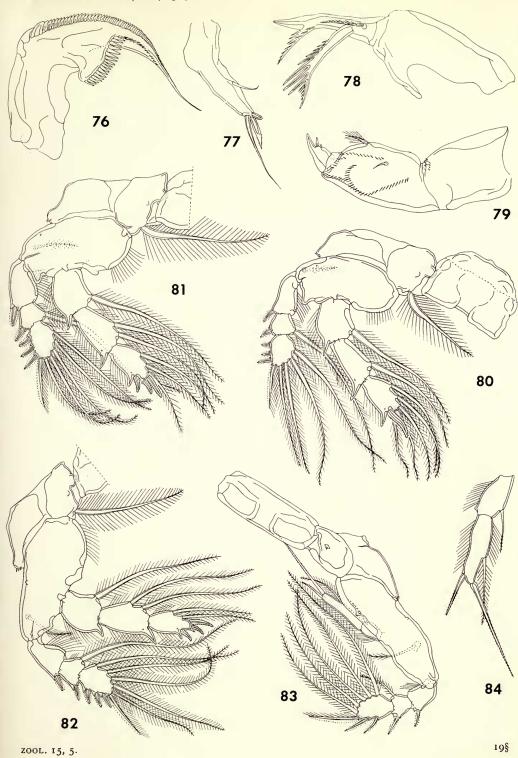
Fig. 74. Tip of second antenna, anterior (F).

Fig. 75. Labrum, ventral (c).



## Stellicola femineus n. sp., female (continued)

- Fig. 76. Mandible, posterior (F).
- Fig. 77. First maxilla, anterolateral (F).
- Fig. 78. Second maxilla, posterior (F).
- Fig. 79. Maxilliped, posterior (F).
- Fig. 80. Leg I and intercoxal plate, anterior (B).
- Fig. 81. Leg 2, anterior (B).
- Fig. 82. Leg 3, anterior (B).
- Fig. 83. Leg 4 and intercoxal plate, anterior (B).
- Fig. 84. Endopod of leg 4, anterior (F).



# Stellicola femineus n. sp., female (continued)

Fig. 85. Leg 5, dorsal (F).

## Stellicola femineus n. sp., male

Fig. 86. Dorsal (A).

Fig. 87. Urosome, dorsal (B).

Fig. 88. Labrum, ventral (F).

Fig. 89. Maxilliped, postero-inner (D).

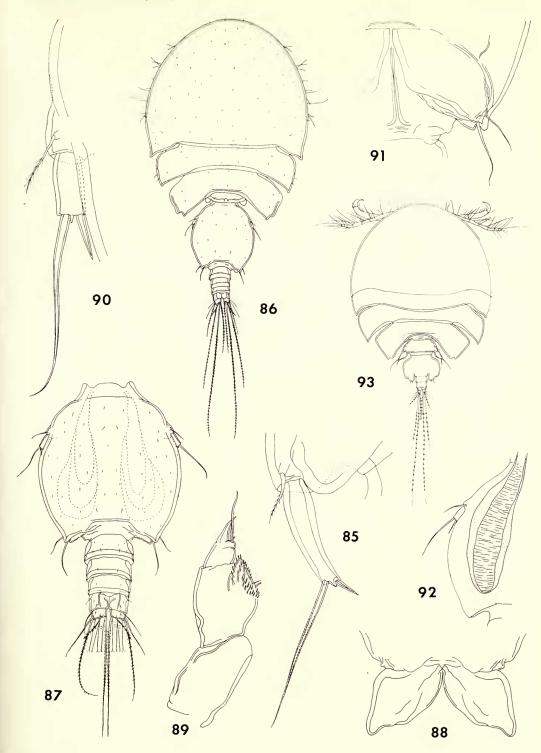
Fig. 90. Leg 5, dorsal (E).

Fig. 91. Leg 6, ventral (F).

Fig. 92. Spermatophore, inside male, dorsal (B).

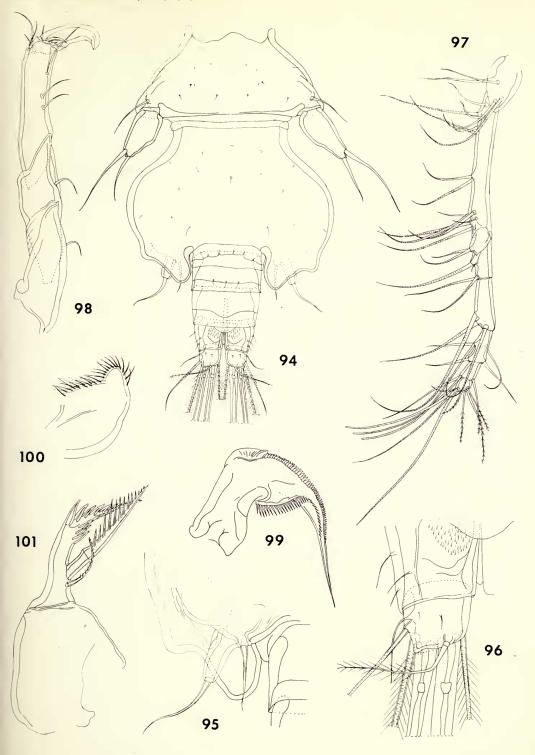
Stellicola pollex n. sp., female

Fig. 93. Dorsal (H).



## Stellicola pollex n. sp., female (continued)

- Fig. 94. Urosome, dorsal (c).
- Fig. 95. Area of attachment of egg sac, ventral (D).
- Fig. 96. Caudal ramus, dorsal (E).
- Fig. 97. First antenna, ventral (c).
- Fig. 98. Second antenna, posterior (c).
- Fig. 99. Mandible, posterior (F).
- Fig. 100. Paragnath, ventral (G).
- Fig. 101. Second maxilla, posterior (D).



# Stellicola pollex n. sp., female (continued)

Fig. 102. Maxilliped, posterior (D).

Fig. 103. Leg I and intercoxal plate, anterior (c).

Fig. 104. Leg 2, anterior (c).

Fig. 105. Leg 3, anterior (c).

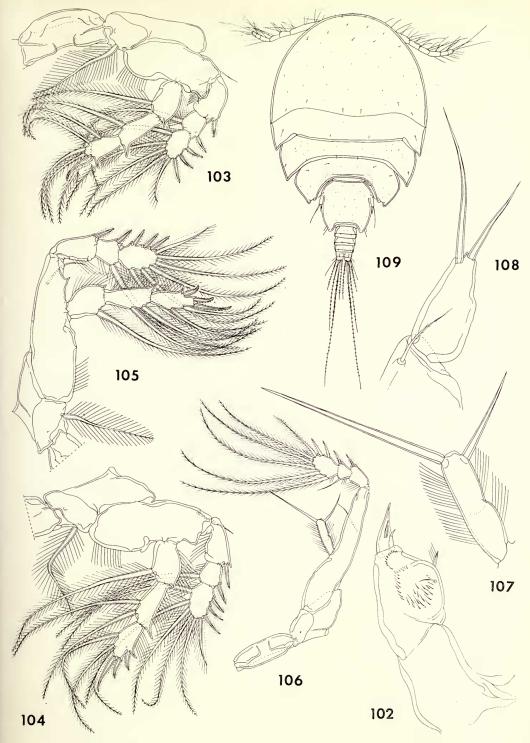
Fig. 106. Leg 4 and intercoxal plate, anterior (c).

Fig. 107. Endopod of leg 4, anterior (E).

Fig. 108. Leg 5, dorsal (D).

Stellicola pollex n. sp., male

Fig. 109. Dorsal (1).



## Stellicola pollex n. sp., male (continued)

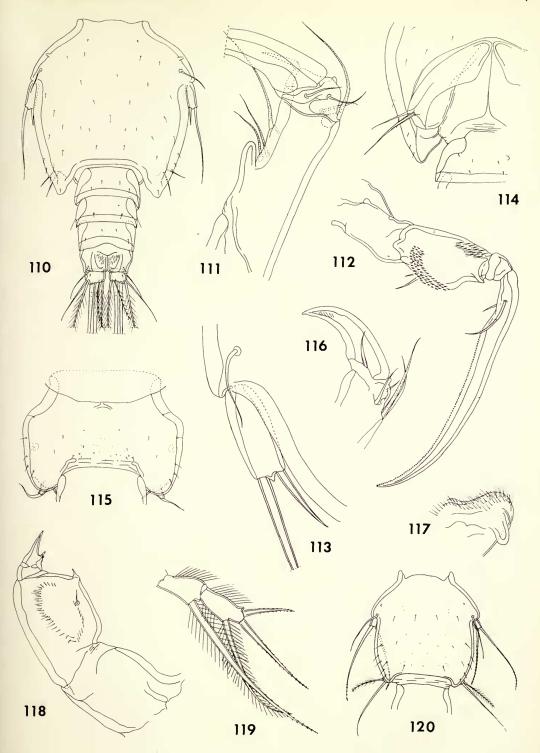
- Fig. 110. Urosome, dorsal (F).
- Fig. 111. Third segment of second antenna, anterior (E).
- Fig. 112. Maxilliped, postero-inner (D).
- Fig. 113. Leg 5, dorsal (G).
- Fig. 114. Leg 6, ventral (D).

# Stellicola oreastriphilus Kossmann, 1877, female

- Fig. 115. Genital segment, dorsal (c).
- Fig. 116. Tip of second antenna, posterior (F).
- Fig. 117. Paragnath, ventral (E).
- Fig. 118. Maxilliped, anterior (D).
- Fig. 119. Endopod of leg 4, anterior (F).

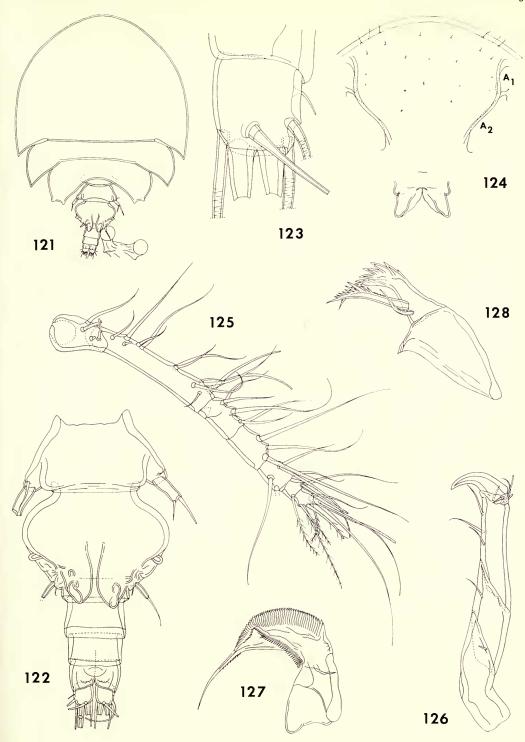
Stellicola oreastriphilus Kossmann, 1877, male

Fig. 120. Segment of leg 5 and genital segment, dorsal (c).



## Stellicola caeruleus (Stebbing, 1900), syntypic female

- Fig. 121. Dorsal (H).
- Fig. 122. Urosome, dorsal (B).
- Fig. 123. Caudal ramus, dorsal (E).
- Fig. 124. Rostrum and labrum, ventral (1).
- Fig. 125. First antenna, ventral (c).
- Fig. 126. Second antenna, anterior (B).
- Fig. 127. Mandible, posterior (F).
- Fig. 128. Second maxilla, posterior (F).



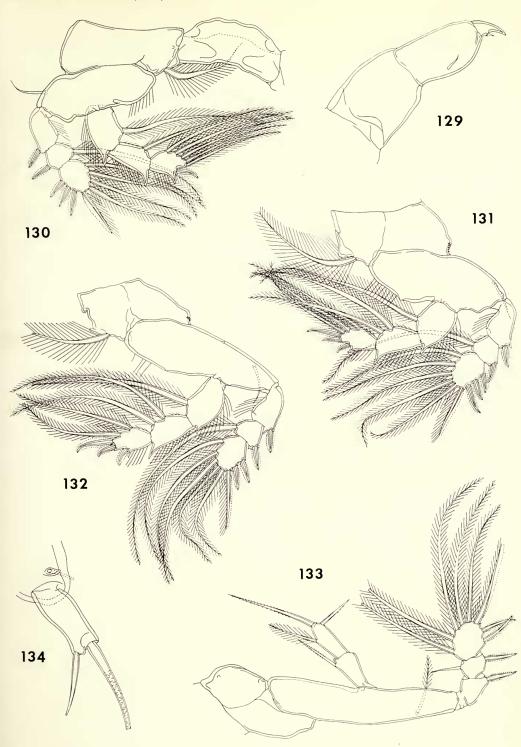
Stellicola caeruleus (Stebbing, 1900), syntypic female (continued)

Fig. 129. Maxilliped, posterior (F). Fig. 130. Leg 1 and intercoxal plate, anterior (c).

Fig. 131. Leg 2, anterior (c).

Fig. 132. Leg 3, anterior (c). Fig. 133. Leg 4, anterior (F).

Fig. 134. Leg 5, dorsal (D).



# Stellicola caeruleus (Stebbing, 1900) syntypic male

Fig. 135. Dorsal (1).

Fig. 136. Urosome, dorsal (F).

Fig. 137. Rostrum, ventral (c).

Fig. 138. Second maxilla, dorsal (E).

Fig. 139. Maxilliped, dorsal (G).

Fig. 140. Leg 5, dorsal (G).

Fig. 141. Leg 6, ventral (E).

